Creating Alternative Mobility Options for Private Mode to Public Transport Mode
A Case of Gandhinagar

10TH UMI Conference, 2017
Gandhinagar being a planned city has good infrastructure facilities but lacks good public transport facility.

Increase in private transport dependency create congestion, safety issues and adverse impact on environment.

Hence it is important to understand the transport dynamics of the city, to change the mode choice of people from private to public mode of transportation.
Aim
To Propose Feasible Public Transportation Network Which Provide Alternative Mobility Option For Private Mode Of Transport Users.

Objectives
• To understand the transport dynamics of the city.
• To develop public transportation network within city.
• To propose institutional framework for operation and management of public transport system.

Scope & Limitation
The scope of the study is limited to the GMC area and does not cover the entire GUDA area.
Methodology

Data Collection

- Literature Review
  - Study of articles on Public Transport Planning
- Case Studies
  - Basis of selection of city
    - Local context
- Surveys
  - Cordon point survey
  - HH Survey
  - PHPDT

Route Planning
Schedule

Operation Management Framework

- Demographic data
- Public transport modes & network
- Modal share
- Socio Economic Data
- PCU

* GIS: Geographic Information System, PHPDT: Peak Hour Peak Direction Traffic
Design principles for the public transport network effect

- Simple and direct network structures
- Plan a hierarchy of lines into a network
- Plan for speed, consistency and reliability
- Coordinate convenient transfers
- Provide clear, ubiquitous and consistent information and marking

Route Planning Service Type

- Trunk-Feeder Services
- Direct Services
Trunk-feeder services

- Larger vehicles in high density corridors; smaller vehicles in low density corridors feed them (Bogota, Pereira)
- Transfer required
**Advantages**
- Ability to closely match supply and demand
- Increases the number of passengers per vehicle (load factor)
- Feeder buses are smaller and cheaper to procure
- Usually accompanied by bus sector reform (concessions, contracting and operational control)

**Disadvantages**
- Requirement of transfer
  - Customers with baggage, children find transfers difficult
  - Customers tend to penalize “waiting time” more severely than “travel time”
  - Occasionally, transfers may imply a detour
- Infrastructure costs to build transfer stations and maintaining them
Direct services

• Take passengers directly from origin to destination; no need of transfer (Pune, Delhi)
Advantages

• Time savings
  o Minimum transfers required
  o More direct routing to destination

• Infrastructure costs savings
  o Interchange stations may not be constructed

Disadvantages

• Operational efficiency
  • Same bus is used throughout the route
  • Lower load factor; more vehicles
  • Lesser average speeds/ more travel time
  • Congestion outside segregated corridor

• Additional vehicle costs
  • Same vehicle may need to have doors on both sides or
  • Bus stops on corridor may double if curb side bus stops are built

• Complicated junction and signal phase design
Study Area
Study Area
Demography

Area: 57 sq km
Population: 2,06,167
M = 1,07,492
F = 98,675
Sex Ratio: 918:1000
Density: 36 PPH
Study Area (Land Use Pattern)
Study Area
(Street Patterns and Junctions)
SWOT Analysis

**S** - Strengths

- Capital of the State
- Availability of proper IPT connectivity
- Majority of roads are lined with Tree Plantation
- Presence of Traffic Monitoring Infrastructure
- Use of Renewable energy

**W** - Weaknesses

- Less usage of Public transportation
- On-street Parking
- Lack of Mixed use development

**O** - Opportunities

- Selection among 100 Smart cities.
- Upcoming MEGA project.
- GIFT city and Institutional Zone
- Improving traffic regulatory mechanisms
- Cycle sharing projects
- Development of IT SEZ

**T** - Threats

- Use of contemporary fuel leading to increase in pollution
- Increasing dependency on Private vehicles
- Tag of “Green City” at stake
- Dependency on other cities for employment
Total Population of City: 2,06,167
Avg. HH Size: 5
Total HH of City: 41,933

Total sample size - 1% of the total households: 419 HH

Distribution among sectors according to the number of households in the sectors.

Total Households surveyed = 474 (419 within sectors + 55 surrounding villages)
**Data Analysis**

**HH profile**

**Income Group**
- HIG; 42; 10%
- LIG; 13%
- MIG; 324; 77%

**Age Group**
- 0-15; 12%
- 16-25; 22%
- 26-40; 27%
- 41-60; 28%
- > 60; 11%

**Building Typology**
- Slum
- Semi detached
- Row House
- Government Quarters
- Bunglow
- Apartment

**Family Size**

<table>
<thead>
<tr>
<th>Family Size</th>
<th>Nos of Families</th>
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<tr>
<td>1-2</td>
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<td>3</td>
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Data Analysis

Trip Purpose

- Work: 37%
- Education: 24%
- Shopping: 25%
- Recreation: 8%
- Religious: 5%
- Other: 1%

Mode of Transport (Daily Trips)

- Pvt: 60%
- Public: 6%
- IPT: 13%
- Walk: 21%

Peak hour

- % of Total Trips
- Travel Time (minute)

2001

- 2011
- 2016

Travel Time (minute)
Trip Links
(Origin-Destination survey)

Demand
(Internal to Internal within sector)
(Internal to Internal other sector)
Attraction and Production TAZ are Sector 21, 23, 24, 29, 25 GIDC, 10, 16, 2, 3, 4, 5, 6, 7, 8

Inferences
Major trips are towards Sector 21, 24, 6, 7 & 16. Because of agglomeration of Commercial activities.
Trips towards Sector 10 are also high, due to Institutional zone.
Data Collection (Existing Transportation Modes)

Public transit

Para transit
Main bus station at Pathikashram (Gh-3),
Start from Gh-6,
Other pick up stand at Sachivalay.

Data Collection (GSRTC route and bus stop mapping)
Data Collection
(VTCOS route and Bus stop mapping, PHPDT survey)

Pathika-25/26 GIDC-Unava
Pathika-Adalaj-Chandkheda
Pathika-Pathika
Pathika-Pethapur-Pathika
Pathika-Chiloda-Pathika
Sector 3-4-5-6, Sachivalay-Railway Station
In pick hours

Data Collection (Cordon Point Survey)
Morning Data - 9:30 to 10:30

Note: Similar survey was done for afternoon and evening.
Proposals
(Concept of Route Planning)

Conceptual radial network strategy
Radial network strategy in a poly centric city

Radial Network Strategies

Proposals (Concept of Route Planning)

Conceptual dispersed network strategy

Conceptual dispersed network strategy indicating transfer opportunities

Proposals
(Concept of Route Planning)
Proposals
(Route Planning and Scheduling)
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<thead>
<tr>
<th>Proposals (Route Planning and Scheduling)</th>
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<tbody>
<tr>
<td>Distances (km)</td>
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<td></td>
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<tr>
<td>Average speed (km/hr)</td>
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<tr>
<td>Type of route</td>
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<td>Number of Buses</td>
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<td>Number of drivers</td>
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<td>Timings: Bus-1</td>
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<td>Session 1</td>
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<td>08:15 am</td>
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<td>09:15 am</td>
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<td>01:30 pm</td>
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<td>06:00 pm</td>
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<tr>
<td>07:15 pm</td>
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<td>10:00 am</td>
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Proposals (Route Planning for Special Routes)
Proposals (Route Planning for GUDA area)
Proposals
(Route Planning for Public Transport Mode - Integration Map – GUDA+GMC)
**Ticketing System**

1. Passenger
2. Online Ticketing
3. OTP generated & Shared with passenger
4. Utilized by Family & friends Of passenger
5. Multiple Passengers, Multiple tickets
6. Points earned on Every trip made In buses or metro
7. Applicable for Shopping
8. More tickets, More discount

*GIS: Geographic Information System, PHPDT: Peak Hour Peak Direction Traffic*
A day can be celebrated as a car free day encouraging pedestrians and cyclist. This days can be increased after providing proper cycling infrastructure and this will also help in promoting proper public transport.
Institutional Framework

State Ministry of Transport

GMC

City Bus Committee

Delivery Agency

Fiduciary

Central Ministry of Finance
Licensing (O&M) Contract

Urban Local Body

Licensing Private Operator

Procurement of Buses

Operation & Maintenance

Private Operator

Route Planning & Scheduling

Collects Revenue

Royalty per Kilometer

Framework
Functioning buses: 10
Spare buses: 5
Total buses: 15

Inference
Electric buses generate 27% more revenue and 82% more profits than diesel buses per day

<table>
<thead>
<tr>
<th></th>
<th>Diesel buses</th>
<th>Electric buses</th>
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<tbody>
<tr>
<td>Cost of 1 bus</td>
<td>85,00,000</td>
<td>300,00,000</td>
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<tr>
<td>Cost of 15 buses</td>
<td>1275,00,000</td>
<td>4500,00,000</td>
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<tr>
<td>Average revenue/day</td>
<td>9,256</td>
<td>11,781</td>
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<tr>
<td>Average travel cost/day</td>
<td>4,843</td>
<td>2,064</td>
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<tr>
<td>Average profits earned/day</td>
<td>4,344</td>
<td>9,717</td>
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<tr>
<td>Annual profits earned</td>
<td>2,077,580</td>
<td>3,793,445</td>
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<tr>
<td>Losses</td>
<td>2,847</td>
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Source: http://www.thebetterindia.com/49637/electric-buses-vs-diesel-buses-iisc-study/
Thank You